

Serial No. 10/662,368

Attorney Docket No. 01-241-DIV-RCE

REMARKS

A Form PTO 1449 was filed on 17 January 2006. However, a copy of the form PTO-1449 filed on 17 January 2006 was not received with the office action, which was mailed on February 13, 2006. In addition, a Form PTO-1449 was filed on 13 June 2006. The applicants respectfully request an initialed copy of both forms PTO-1449.

Claims 6-7 and 10-16 are pending. Claims 8-9 have been canceled. The applicants respectfully request reconsideration and allowance of this application in view of the above amendments and the following remarks.

Claims 6-15 were rejected under 35 USC 112, second paragraph, as being indefinite. The office action identifies particular language in claim 6 which is considered to be indefinite. The claims have been carefully reviewed and revised. In view of the above amended claims, the examiner is respectfully requested to reconsider and withdraw the rejection.

Claims 6-8 were rejected under 35 USC 102(e) as being anticipated by U.S. Patent No. 6,010,769, Sasaoka et al. ("Sasaoka"). Claims 9-15 were rejected under 35 USC 103(a) as being unpatentable over Sasaoka. Independent claim 6 has been amended and incorporates the features of claim 8 and 9; further support for amended claim 6 is located in the specification as filed, for example page 6, line 6-page 7, line 4; page 10, line 6-page 11, line 8; page 11, line 26-page 12, line 4.

Insofar as the rejections can be applied to the claims as amended, the rejections are respectfully traversed for reasons including the following, which are provided by way of example. Independent claim 6 recites in combination, for example, "packing an interlayer connecting material in the via-hole formed in the insulator board, the interlayer connecting material including a first metal and a second metal having a higher melting point than a heating

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temperature required for interconnecting the first and second conductor patterns;” “interconnecting electrically the first and second conductor patterns with a unified conductive compound formed from the first and second metals sintered by hot-pressing the interlayer connecting material in the via-hole.” “By the interconnecting, first and second solid phase diffusion layers are formed from the metal in the first and second conductive patterns and the first metal of the unified conductor compound diffused into the metal in the first and second conductor patterns and are located between the unified conductive compound and the first and second conductor patterns, and a volume of the unified conductive compound is reduced relative to a volume of the interlayer connecting material.” Also, “a sidewall of the unified conductive compound in the via-hole becomes concave in shape and approaches a center axis of the via-hole approximately halfway between the first surface and the second surface of the insulator board.” Accordingly, the formation of the unified conductive compound, the formation of the solid phase diffusion layer and the deformation of the unified conductive compound can be simultaneously carried out by the interconnecting process. The fabrication method therefore can be simplified.

Without conceding that Sasaoka discloses any feature of the present invention, Sasaoka is directed to a multilayer wiring board. According to Sasaoka, conductive pillars 14 are used for interconnection of wiring layers. In Sasaoka, an electrical interconnection is made by mechanical contact.

Sasaoka's conductive pillars 14 are formed from phenol resin conductive paste containing silver powder as filler (Col. 21, lines 18-40). After the conductive pillars 14 are formed on both surfaces of a first insulating layer 11a, the second insulating layer 11b and a wiring circuit 13 are laminated on both sides of the first insulating layer 11a. Then, the laminated layers are hot-pressed. As a result, the conductive pillar 14 pierces the second insulating layer 11b in a semi-cured state, and reaches the wiring circuit 13. In this way, the

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conductive pillar 14 provides an electrical interconnection between lands 12a, 13a respectively formed on the first and second insulating layers 11a, 11b. Because the electrical interconnection is made by mechanical contact, the reliability of the interconnection is relatively low.

The office action asserts that Sasaoka discloses the invention as claimed. To the contrary, Sasaoka fails to teach or suggest the invention, as presently claimed, when the claims are considered as a whole.

In amended independent claim 6, as compared with Sasaoka, the interlayer connecting material includes a first metal and a second metal having a higher melting point than a heating temperature required for interconnecting the first and second conductor patterns. Sasaoka fails to teach or suggest the first and second metals as recited.

When the interlayer connecting material is hot-pressed by the interconnection process, the first and second metals are sintered and form a unified conductive compound. Sasaoka, in contrast, fails to teach or suggest that the interlayer connecting materials is sintered to form a unified conductive compound.

In addition, first and second solid phase diffusion layers are formed from the metal in the first and second conductive patterns and the first metal of the unified conductive compound diffused into the metal in the first and second conductor patterns and are located between the unified conductive compound and the first and second conductor patterns. In Sasaoka, to the contrary, solid phase diffusion layers are not produced between the conductive pillar and wiring layers.

The conductor patterns of the recited invention, accordingly, are electrically interconnected by the unified conductive compound and the solid phase diffusion layers. In

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other words, because the connection between the patterns is not made by mechanical contact as shown for example in Sasaoka, electronic connection and mechanical durability can be improved.

Moreover, during the interconnecting as recited in claim 6, the volume of the unified conductive compound is reduced relative to the volume of the interlayer connecting material. Due to this volume reduction and pressure applied to the unified conductive compound through the insulator board, a sidewall of the unified conductive compound in the via-hole becomes concave in shape and approaches a center axis of the via-hole approximately halfway between the first surface and the second surface of the insulator board. As a result, it is possible to prevent the connecting portion between the conductor pattern and the unified conductive compound from being destroyed by stress.

Because the conductive pillar 14 in Sasaoka contains only one kind of metal (silver), the conductive pillar 14 is not changed into a unified conductive compound by hot-pressing. In addition, because silver contained in Sasaoka's conductive pillar 14 does not diffuse into copper forming wiring layers 12, 13, solid diffusion layers are not produced between the conductive pillar 14 and the wiring layers 12, 13.

Sasaoka fails to teach or suggest, for example, these elements recited in independent claim 6. It is respectfully submitted therefore that claim 6 is patentable over Sasaoka.

For at least these reasons, the combination of features recited in independent claim 6, when interpreted as a whole, is submitted to patentably distinguish over the prior art. In addition, Sasaoka clearly fails to show other recited elements as well.

With respect to the rejected dependent claims, applicants respectfully submit that these claims are allowable not only by virtue of their dependency from independent claim 6, but also because of additional features they recite in combination.

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New claim 16 has been added to further define the invention, and is believed to be patentable for reasons including those set out above. Support for new claim 16 is located in the application as filed, for example Fig. 2A element 62, and accompanying description.

Applicants respectfully submit that, as described above, the cited prior art does not show or suggest the combination of features recited in the claims. Applicants do not concede that the cited prior art shows any of the elements recited in the claims. However, applicants have provided specific examples of elements in the claims that are clearly not present in the cited prior art.

Applicants strongly emphasize that one reviewing the prosecution history should not interpret any of the examples applicants have described herein in connection with distinguishing over the prior art as limiting to those specific features in isolation. Rather, for the sake of simplicity, applicants have provided examples of why the claims described above are distinguishable over the cited prior art.

In view of the foregoing, the applicants submit that this application is in condition for allowance. A timely notice to that effect is respectfully requested.

If questions relating to patentability remain, the examiner is invited to contact the undersigned by telephone.

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If there are any problems with the payment of fees, please charge any underpayments and credit any overpayments to Deposit Account No. 50-1147.

Respectfully submitted,



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